

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

REC'D 23 FEB 2006  
WIPO PCT

Applicant's or agent's file reference 1200308WO	<b>FOR FURTHER ACTION</b> REC'D 23 FEB 2006 See Form PCT/IPEA/416 PCT	
International application No. PCT/US2004/023203	International filing date (day/month/year) 19 July 2004	Priority date (day/month/year) 7 August 2003
International Patent Classification (IPC) or national classification and IPC  INT. CL.  C08K 3/00 (2006.01) C08K 3/24 (2006.01) C08L 21/00 (2006.01) C08K 3/10 (2006.01) C08K 3/34 (2006.01) C08L 23/16 (2006.01) C08K 3/16 (2006.01) C08K 13/02 (2006.01) AND US: 524/436, 524/786, 524/411, 525/133		
Applicant POLYONE CORPORATION et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
- a. ☒ (sent to the applicant and to the International Bureau) a total of 2 sheets, as follows:
- ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
- ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
- b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in electronic readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:
- ☒ Box No. I Basis of the report
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 28 February 2005	Date of completion of this report 17 FEB 2006
Name and mailing address of the IPEA/US  Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 FACSIMILE NO. 571-273 3201	Authorized Officer  Lee W. Young Telephone No. 571-272-7774

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/US2004/023203

## Box No. I Basis of the report

1. With regard to the language, this report is based on:

☒ The international application in the language in which it was filed

☐ A translation of the international application into  
translation furnished for the purposes of:

, which is the language of a

☐ international search (under Rules 12.3(a) and 23.1 (b))

☐ publication of the international application (under Rule 12.4(a))

☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

☐ the international application as originally filed/furnished

☒ the description:

pages 1-48 as originally filed/furnished

pages\* received by this Authority on

pages\* received by this Authority on

☒ the claims:

pages as originally filed/furnished

pages\* as amended (together with any statement) under Article 19

pages\* 49-50 received by this Authority on 28 February 2005

pages\* received by this Authority on

☐ the drawings:

pages as originally filed/furnished

pages\* received by this Authority on

pages\* received by this Authority on

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☒ The amendments have resulted in the cancellation of:

☐ the description, pages

☒ the claims, Nos.9-11

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages

☐ the claims, Nos.

☐ the drawings, sheets/figs

☐ the sequence listing (*specify*):

☐ any table(s) related to the sequence listing (*specify*):

\* If item 4 applies, some or all of those sheets may be marked "superseded."

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/US2004/023203

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims 4-8	YES
	Claims 1-3	NO
Inventive step (IS)	Claims	YES
	Claims 1-8	NO
Industrial applicability (IA)	Claims 1-8	YES
	Claims	NO

## 2. Citations and explanations (Rule 70.7)

D1: US 2726224

D2: US 4311628

### NOVELTY

The amended claims define a thermoplastic elastomer prepared using a catalyst system comprising: at least one non-brominated phenolic resin; at least one non-transition metal halide; at least one acid selected from the group consisting of oxalic acid, citric acid, stearic acid and combinations thereof; and optionally, at least one hydrogen halide scavenger.

#### Claims 1-3

Given that D1 discloses a process of curing for elastomers by using a non-brominated phenolic resin as a curing agent and a heavy metal halide as the accelerator in conjunction with stearic acid, and optionally with a hydrogen halide scavenger such as zinc oxide. See Table VII, wherein aluminium chloride, a non-transition metal halide is used in conjunction with dimethylol phenol resin and stearic acid to cure butyl rubber. The citation is considered to anticipate the novelty of claims 1-3.

None of the citations discloses the preparation of a thermoplastic elastomeric composition comprising the elastomer and a thermoplastic polymer using the catalyst system as defined. Therefore, claims 4-8 are novel.

### INVENTIVE STEP

#### Claims 1-3

Claims 1-3 lack an inventive step for reasons above.

#### Claims 4-8

D1 discloses a thermoplastic elastomer (e.g. modified butyl rubber) which is prepared by a catalyst system as defined comprising a non-transition metal halide, non-brominated phenolic resin and stearic acid. The amount of phenolic resin, halide and acid used in examples VIIA and VIIB all fall within the ranges claimed. D1 does not disclose a thermoplastic polymer in addition to the uncured elastomer in the process of preparing the elastomer.

D2 discloses a thermoplastic elastomeric composition comprising an uncured elastomer (e.g. EPDM rubber), a thermoplastic polymer (polypropylene) prepared by a similar catalyst system, said catalyst system comprising a non-brominated phenolic resin (e.g. dimethylol phenol), a metal halide such as stannous chloride, or ferric chloride, stearic acid and optionally a hydrogen scavenger such as zinc oxide. The elastomer composition is prepared by extrusion of the polymers with the catalyst system.

Therefore, the additional features added by claims 4-8 are disclosed in the citations, so that the claims are anticipated by the obvious combination of the disclosure in D1 and D2.

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

International application No.

**PCT/US2004/023203**

**Box No. VIII**    **Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

\_\_\_\_\_

What is claimed is:

1. A thermoplastic elastomer prepared using a catalyst system comprising:
  - at least one non-brominated phenolic resin;
  - 5 at least one non-transition metal halide;
  - at least one acid selected from the group consisting of oxalic acid, citric acid, stearic acid, and combinations thereof; and
  - optionally, at least one hydrogen halide scavenger.
- 10 2. The thermoplastic elastomer of claim 1, wherein the at least one phenolic resin comprises methanol groups.
3. The thermoplastic elastomer of claim 1, wherein the halide comprises magnesium chloride, calcium chloride, sodium chloride, potassium
  - 15 chloride, aluminum chloride, or combinations thereof.
4. A process for making a thermoplastic elastomer, the process comprising:
  - providing a catalyst system;
  - 20 providing at least one thermoplastic polymer or precursors for at least one thermoplastic polymer;
  - providing at least one uncured elastomer;
  - mixing components of the catalyst system, simultaneously or sequentially, with the uncured elastomer; and
  - 25 heating the uncured elastomer in the presence of the catalyst system to form the thermoplastic elastomer composition,
  - wherein the catalyst system comprises at least one non-brominated phenolic resin;
  - at least one non-transition metal halide;

at least one acid selected from the group consisting of oxalic acid, citric acid, stearic acid, and combinations thereof, and optionally, at least one hydrogen halide scavenger.

5           5.     The process of claim 4, wherein the amount of the phenolic resin used is about 2 to about 10 percent by weight based on total weight of the uncured elastomer.

10           6.     The process of Claim 4, wherein the amount of the halide used is about 2 to about 8 percent by weight based on total weight of the uncured elastomer.

15           7.     The process of Claim 4, wherein the amount of the acid used is about 1 to about 5 percent by weight based on total weight of the uncured elastomer.

          8.     The process of claim 4, wherein the thermoplastic elastomer composition is prepared using reactive extrusion.

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